Tularemia *(Francisella tularensis)*

Report Immediately

May 2003

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Francisella tularensis, the agent of tularemia, is a gram-negative bacterium. Two types of *F. tularensis* (A and B) occur in the United States. Type A organisms are classified as *F. tularensis* biovar *tularensis*, type B organisms as *F. tularensis* biovar *palaearctica*.

B. Clinical Description and Laboratory Diagnosis

The primary clinical forms of tularemia vary in severity and presentation according to virulence of the infecting organism, dose, and site of inoculum. Primary disease presentations include ulceroglandular, glandular, oculoglandular, oropharyngeal, pneumonic, typhoidal, and septic forms. The term *typhoidal tularemia* has been used to describe illness in tularemia patients with systemic infections manifesting as fever and other constitutional signs without cutaneous or mucosal membrane lesions or regional lymphadenitis. Sometimes, these patients present with prominent gastrointestinal manifestations, such as diarrhea and pain. The onset of tularemia is usually abrupt, with fever (38°C-40°C), headache, chills and rigors, generalized body aches (often prominent in the low back), coryza, and sore throat. A pulse-temperature dissociation has been noted in as many as 42% of patients. A dry or slightly productive cough and substernal pain or tightness frequently occur with or without objective signs of pneumonia, such as purulent sputum, dyspnea, tachypnea, pleuritic pain, or hemoptysis. Nausea, vomiting, and diarrhea sometimes occur. Sweats, fever and chills, progressive weakness, malaise, anorexia, and weight loss characterize the continuing illness. Studies of volunteers have shown that *F. tularensis* aerosol exposures can incapacitate some persons in the first 1 or 2 days of illness, and significant impairment in performing tasks can continue for days after antibiotic treatment is begun. In untreated tularemia, symptoms often persist for several weeks and, sometimes, for months, usually with progressive debility. Any form of tularemia may be complicated by hematogenous spread, resulting in secondary pleuropneumonia, sepsis, and, rarely, meningitis. Illness usually falls into one of the following categories.

Ulceroglandular: the form that typically arises from handling a contaminated carcass or following an infective arthropod bite. Patients present with large, tender lymph nodes and a non-healing skin ulcer at the site of introduction of the bacteria, often accompanied by fatigue, chills and malaise.

Glandular: Patients present with one or more enlarged and painful lymph nodes that may become filled with pus.

Pneumonic (pulmonary): It occurs as a primary infection following inhalation of organisms, or secondary to bacteremia; resembles plague, with symptoms including non-productive cough, difficulty breathing and chest pain. Patchy bilateral infiltrates are seen on chest x-ray.

Typhoidal: This is a rare form of tularemia, with development of enlarged and inflamed mesenteric lymph nodes, septicemia, abdominal pain (often protracted), diarrhea, vomiting and gastrointestinal bleeding.

Oropharyngeal: After ingestion of bacteria in contaminated food or water, patients present with a painful pharyngitis (with our without ulceration), abdominal pain, diarrhea and vomiting.

Oculoglandular: Patients present with painful, pus-oozing conjunctivitis, with enlarged lymph nodes of the neck or near the ears, and usually with fever, chills and malaise.

Type A *F. tularensis* is more virulent; respiratory or ulceroglandular disease may result from contact with very few organisms. Type B organisms cause milder disease and require a higher dose to cause infection. The case-fatality ratio in untreated typhoidal tularemia can be 30–60%. Pulmonary tularemia requires prompt treatment

to prevent a fatal outcome. The case-fatality ratio of type A tularemia is 5–15% if untreated, primarily due to typhoidal or pulmonary disease.
Laboratory diagnosis is based on rise of specific serum antibodies (they appear usually in the second week of disease), identification of *F. tularensis* in lymph node aspirates and others clinical specimens by fluorescent antibody test, or by culture the bacteria on special media. **Extreme care must be exercised to avoid laboratory transmission**. Antigen detection assays, polymerase chain reaction, enzyme-linked immunoassays are used in research and reference laboratories to identify *F. tularensis.*

C. Reservoirs

Type A infections are acquired from rabbits or *Dermacentor* ticks. Type B infections are associated with a wide variety of mammalian hosts; rabbits, hares, and some rodents (*e.g.,* beavers, muskrats) are particularly important. Domestic mammals, including livestock and cats, can acquire and spread the disease. Humans are usually dead-end hosts (*i.e.,* they do not transmit the infection to others).

D. Modes of Transmission

Probably no bacterial agent has more diversified modes of transmission than *F. tularensis.* Infection can occur by direct contact (*e.g.*, while skinning/dressing wild game, especially rabbits and rodents); by arthropod bite (deer flies, horse flies, and ticks; the common dog tick, *Dermacentor variabilis,* is the most often implicated in the Northeast); by ingestion (*e.g.,* contaminated untreated drinking water, contaminated unpasteurized milk or contaminated undercooked rabbit or hare meat); or by inhalation (following exposure to cats with pulmonary tularemia, infectious aerosols generated while handling animal hides or cleaning areas with dried rodent carcasses, or infectious aerosols generated by winnowing, moving or loading contaminated grain). Less commonly, transmission may result from the bites or scratches of dogs, cats, carnivorous mammals or birds of prey that have killed or fed on infected animals. Laboratory infections can also occur; these frequently present as pulmonary or typhoidal tularemia. As noted above, the infection progresses from the portal of entry, thereby determining the kind of illness.
F. tularensis is resistant, surviving for weeks to months in cool water or mud, in tap water for up to 3 months, and in dry straw litter for as long as 6 months. Frozen (*e.g.,* in rabbit meat), it may remain infective for several years. Concentrations of chlorine attained in routine water purification are very effective at killing *F. tularensis*, as are trace amounts of copper sulfate or zinc.

E. Incubation Period

Related to virulence of infecting strain and to size of inoculum, the incubation period for tularemia ranges from 1 to 14 days, but is usually 3–5 days.

F. Period of Communicability or Infectious Period

Tularemia is generally not directly transmitted from person-to-person. However, drainage from tularemic lesions is potentially infectious, and persons with the pulmonary form of tularemia may possibly aerosolize pathogenic bacteria during the course of their clinical illness. Flies can remain infective for 14 days and ticks throughout their lifetime. Rabbit meat frozen at 5°F (–15°C) can remain infective for over 3 years.

G. Epidemiology

Tularemia occurs throughout North America and in many parts of continental Europe, the former Soviet Union, China and Japan. In the United States, it occurs in all months of the year; incidence may be higher in adults in early winter (during rabbit-hunting season) and in children during the summer (when ticks and flies are abundant). Type A *F. tularensis*, found only in the United States, is common in rabbits (cottontail, jack and snowshoe) and is frequently transmitted by a tick bite. Type B *F. tularensis* strains are commonly found in mammals other than rabbits in North America.

H. Bioterrorist Potential

F. tularensis is considered a potential bioterrorist agent. As is true of plague, cases acquired by inhalation would present as primary pneumonia. If acquired and properly disseminated, *F. tularensis* could cause a

serious public health challenge in terms of ability to limit the numbers of casualties and control other repercussions from such an attack.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. CASE CLASSIFICATION

A. CONFIRMED

A clinically compatible case, **AND**

- Isolation of *F. tularensis* in a clinical specimen, **OR**
- Fourfold or greater change in serum antibody titer to *F. tularensis* antigen.

B. PROBABLE

A clinically compatible case, **AND**

- Epidemiological link to a confirmed case as determined by the NJDHSS, **OR**
- Elevated serum antibody titer(s) to *F. tularensis* antigen (without fourfold or greater change) in a patient with no history of tularemia vaccination, **OR**
- Detection of *F. tularensis* in a clinical specimen by fluorescent assay.

C. POSSIBLE

Not used.

NOTE: See Section 3 C below for information on how to report a case.

C. Laboratory Testing Services Available

The New Jersey Public Health and Environmental Laboratories (PHEL) provide confirmatory testing services. For antibody testing, serology should be sent to the PHEL. For information on submission of serum for testing, call the PHEL at (609) 984-2622. Infectious and Zoonotic Diseases Program (IZDP) and the PHEL Viral Serology Laboratory will provide guidance on what specimens to send and how to send them.

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Reporting and Surveillance

- To identify where tularemia occurs in New Jersey.
- To focus preventive and control measures.
- To determine whether the source of infection may be a major public health concern (*e.g.,* a water supply, group camp, rodent die-off) and stop transmission from such a source.
- To identify cases and clusters of human illness that may be associated with a bioterrorist event.

B. Laboratory and Healthcare Provider Reporting Requirements

Due to the rarity and potential severity of tularemia, the NJDHSS requests that information about any suspect or known case of tularemia, or any potential exposure that may be a bioterrorist event, **be immediately reported** to the local health officer having jurisdiction over the locality in which the patient lives, or, if unknown, to the health officer in whose jurisdiction the health care provider requesting the laboratory examination is located. If this is not possible, call the NJDHSS Infectious and Zoonotic Diseases Program at 609.588.7500 during business hours, 609.392.2020, after business hours, on weekends and holidays. Such telephone report shall be followed up by a written or electronic report within the 24 hours of the initial report.

C. Local Departments of Health Reporting and Follow-Up Responsibilities

1. **Reporting Requirements**
   The New Jersey Administrative Code (N.J.A.C. 8:57-1.8) stipulates that each local health officers must report the occurrence of any suspect or known case of tularemia, as defined by the reporting criteria in Section 2 A above. Current requirements are that cases be **immediately reported** to the NJDHSS Infectious and Zoonotic Diseases Program.
2. **Case Investigation**
   a. **The most important step a local health officer take if he/she learns of a suspect or confirmed case of tularemia, or any potential exposure that may be a bioterrorist event, is to call the NJDHSS Infectious and Zoonotic Disease Program immediately, any time of the day or night.** Daytime phone numbers are 609.588.7500 or 609.588.3121. The emergency phone number for nights and weekends is 609.392.2020.

   b. The NJDHSS will direct case investigations of tularemia in New Jersey residents. If a bioterrorist event is suspected, the NJDHSS and other response authorities will work closely with local health officers and provide instructions/information on how to proceed.

   c. Following immediate notification of the NJDHSS, the local health officer may be asked to assist in investigating cases that live within their communities, including gathering the following:
      1) The patient's name, age, address, phone number, status (hospitalized, at home, deceased), and parent/guardian information, if applicable.
      2) The name and phone number of the hospital where the patient is or was hospitalized.
      3) The name and phone number of the patient's attending physician if hospitalized.
      4) The name and phone number of the infection control official at the hospital if hospitalized.
      5) If the patient was seen by a healthcare provider before hospitalization, or was seen at more than one hospital, be sure to have these names and phone numbers as well.

   d. Following immediate notification of the NJDHSS, the local health officer may be asked to assist in completing a CDS-1 or the report can be filed electronically over the Internet using the confidential and secure Communicable Disease Reporting System (CDRS). Most of the information can be obtained from the provider or the medical record. Use the following guidelines in completing the report:
      1) Record "Tularemia" as the disease being reported.
      2) Record the patient's demographic information.
      3) Record the date of symptom onset, symptoms, date of diagnosis, hospitalization information (if applicable), and outcome of disease (*e.g.,* recovered, died). Try to be specific about which type of clinical illness applies (*e.g.,* ulceroglandular, pneumonic, typhoidal or oculo-glandular).
      4) Exposure history: use the approximate incubation period range for tularemia (1–14 days). Specifically, focus on the period beginning about 1 day prior to the case's onset date back to approximately 14 days before onset for the following exposures:
         a) Travel history: determine the date(s) and geographic area(s) traveled to by the case.
         b) Ask the case about any tick bites and direct contact with rabbits, rodents or other mammals.
         c) Record this information under the "Comments" sections at the bottom of the case report form.
      5) Indicate where tularemia was acquired. If unsure, state "Unknown."
      6) Include any additional comments regarding the case.

      NOTE: If CDRS is used to report, enter the collected information regarding exposure history, travel and any additional information into "Comments" section.

      7) If there have been several attempts to obtain patient information, (*e.g.,* the patient or healthcare provider does not return your calls or respond to a letter, or the patient refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as possible. Please note on the form the reason why it could not be filled out completely.

After completing the form, it should be faxed to the NJDHSS Infectious and Zoonotic Diseases Program, fax number 609.631.4863, or the report can be filed electronically over the Internet using the confidential and secure Communicable Disease Reporting System (CDRS). Call the IZDP at 609.588.7500 to confirm receipt of your fax.

e. Institution of disease control measures is an integral part of case investigation. It is the local health officer's responsibility to understand, and, if necessary, institute the control guidelines listed below in Section 4 "Controlling Further Spread."

4) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements

None.

B. Protection of Contacts of a Case

There is no immunization or prophylaxis for contacts of cases. Inpatient cases with draining lesions and those with the pulmonary form of the disease should be cared for in accordance with standard precautions. No restrictions are indicated for outpatient management.

C. Managing Special Situations

Reported Incidence Is Higher than Usual/Outbreak Suspected

If multiple cases of tularemia occur in city/town, or if an outbreak is suspected, investigate to determine the source of infection and mode of transmission. A common exposure (such tick bites or unpasteurized milk) should be sought and applicable preventive or control measures should be instituted. Consult with the Infectious and Zoonotic Disease Program at 609.588.7500 as soon as possible. The Program staff can help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several jurisdictions and therefore be difficult to identify at a local level.

Note: If a bioterrorist event is suspected, the NJDHSS and other response authorities will work closely with local boards of health and provide instructions/information on how to proceed.

D. Preventive Measures

Environmental Measures

In general, environmental measures are not necessary. In some cases however, improvements to drinking water supplies may be warranted. Additionally, implicated food items must be removed from the environment. A decision about removing implicated food items from the environment can be made in consultation with the NJDHSS Food and Drug Safety Program at 609.588.3123.

Personal Preventive Measures/Education

- Hunters should wear gloves when skinning wild game, keep their hands/gloves away from their eyes and thoroughly wash their hands after handling wild game carcasses. Wild game meat should be cooked "well done" (to at least 150° F/65° C).
- Drink only treated water when in wilderness areas.
- Use DEET-based insect repellents to reduce the possibility of fly or tick bites. Use insect repellants properly. Repellants that contain DEET (diethyltoluamide) should be used in concentrations no higher than 15% for children and 30% for adults. Avoid overuse of DEET-based products; excess application can lead to adverse reactions. Remember, repellants should *never* be used on infants. Pyrethrum is a repellant that can only be applied onto clothing, *not* exposed skin.
- Avoid tick-infested areas. In areas where contact with ticks may occur, individuals should be advised of the following:

- Wearing long-sleeved shirts and long, light-colored pants tucked into socks or boots.
- Staying on trails when walking or hiking and try to avoid high grass.
- After each day spent in tick-infested areas, checking yourself, your children, and your pets for ticks. Parts of the body ticks like most include the back of the knee, armpit, scalp, groin, and back of the neck.
- Promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out with steady pressure. Once removed, the tick can be saved for identification or should be drowned in rubbing alcohol or in the water.

ADDITIONAL INFORMATION

A *Tularemia* Fact Sheet can be obtained at the NJDHSS website at www.state.nj.us/health.

The CDC) surveillance case definition for tularemia is the same as the criteria outlined in Section 2A of this chapter. CDC case definitions are used by state health departments and CDC to maintain uniform standards for national reporting. For reporting to the NJDHSS, always refer to the criteria in Section 2A.

REFERENCES

American Academy of Pediatrics. 2000 Red Book: Report of the Committee on Infectious Diseases, 25th Edition. Illinois, Academy of Pediatrics, 2000.

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Chin, J., ed. Control of Communicable Diseases Manual, 17th Edition. Washington, DC, American Public Health Association, 2000.

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